

Alternative Investments

CAIA Level II

THIRD EDITION

HOSSEIN KAZEMI, KEITH H. BLACK, DONALD R. CHAMBERS

Alternative Investments

The Wiley Finance series contains books written specifically for finance and investment professionals as well as sophisticated individual investors and their financial advisors. Book topics range from portfolio management to e-commerce, risk management, financial engineering, valuation and financial instrument analysis, as well as much more. For a list of available titles, visit our website at www.WileyFinance.com.

Founded in 1807, Wiley is the oldest independent publishing company in the United States. With offices in North America, Europe, Australia and Asia, Wiley is globally committed to developing and marketing print and electronic products and services for our customers' professional and personal knowledge and understanding.

Alternative Investments

CAIA Level II

Third Edition

HOSSEIN B. KAZEMI
KEITH H. BLACK
DONALD R. CHAMBERS

WILEY

Cover image: © iStock & Shutterstock
Cover design: Zoe Design Works

Copyright © 2009, 2012, 2016 by The CAIA Association. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.
Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600, or on the Web at www.copyright.com. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at www.wiley.com/go/permissions.

Limit of Liability/Disclaimer of Warranty: While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

For general information on our other products and services or for technical support, please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993, or fax (317) 572-4002.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at <http://booksupport.wiley.com>. For more information about Wiley products, visit www.wiley.com.

ISBN 9781119016397 (Hardcover)
ISBN 9781119016366 (ePDF)
ISBN 9781119016380 (ePub)

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

Contents

Preface	xvii
Acknowledgments	xxi
About the Authors	xxiii

PART 1

Asset Allocation and Institutional Investors

CHAPTER 1

Asset Allocation Processes and the Mean-Variance Model	3
1.1 Importance of Asset Allocation	3
1.2 The Five Steps of the Asset Allocation Process	6
1.3 Asset Owners	7
1.4 Objectives and Constraints	9
1.5 Investment Policy Objectives	9
1.6 Investment Policy Constraints	17
1.7 Preparing an Investment Policy Statement	18
1.8 Implementation	22
1.9 Conclusion	33
Notes	34
References	34

CHAPTER 2

Tactical Asset Allocation, Mean-Variance Extensions, Risk Budgeting, Risk Parity, and Factor Investing	35
2.1 Tactical Asset Allocation	35
2.2 Extensions to the Mean-Variance Approach	45
2.3 Risk Budgeting	50
2.4 Risk Parity	55
2.5 Factor Investing	62
2.6 Conclusion	68
Notes	69
References	69

CHAPTER 3

The Endowment Model	71
3.1 Defining Endowments and Foundations	71

3.2	Intergenerational Equity, Inflation, and Spending Challenges	74
3.3	The Endowment Model	76
3.4	Why Might Large Endowments Outperform?	78
3.5	Risks of the Endowment Model	84
3.6	Conclusion	96
	Note	96
	References	96

CHAPTER 4

	Pension Fund Portfolio Management	99
4.1	Development, Motivations, and Types of Pension Plans	99
4.2	Risk Tolerance and Asset Allocation	101
4.3	Defined Benefit Plans	105
4.4	Governmental Social Security Plans	113
4.5	Contrasting Defined Benefit and Contribution Plans	114
4.6	Annuities for Retirement Income	117
4.7	Conclusion	122
	Notes	122
	References	122

CHAPTER 5

	Sovereign Wealth Funds	125
5.1	Sources of Sovereign Wealth	125
5.2	Four Types of Sovereign Wealth Funds	128
5.3	Establishment and Management of Sovereign Wealth Funds	131
5.4	Emergence of Sovereign Wealth Funds	134
5.5	Governance and Political Risks of SWFs	136
5.6	Analysis of Three Sovereign Wealth Funds	138
5.7	Conclusion	141
	Notes	142
	References	142

CHAPTER 6

	The Family Office Model	145
6.1	Identifying Family Offices	145
6.2	Goals, Benefits, and Business Models of Family Offices	145
6.3	Family Office Goals by Generations	150
6.4	Macroeconomic Exposures of Family Offices	155
6.5	Income Taxes of Family Offices	157
6.6	Lifestyle Assets of Family Offices	160
6.7	Family Office Governance	164
6.8	Charity, Philanthropy, and Impact Investing	167
6.9	Ten Competitive Advantages of Family Offices	170
6.10	Conclusion	172
	Notes	172
	References	173

PART 2**Private Equity****CHAPTER 7****Private Equity Market Structure 177**

7.1 Main Strategies of Private Equity Investment	177
7.2 Main Differences between Venture Capital and Buyout	178
7.3 PE Funds as Intermediaries	181
7.4 PE Funds of Funds as Intermediaries	184
7.5 The Relationship Life Cycle between LPs and GPs	187
7.6 Limited Partnership Key Features	190
7.7 Co-Investments	198
7.8 Conclusion	202
Notes	202
References	203

CHAPTER 8**Private Equity Benchmarking 205**

8.1 The Valuation of PE Assets	206
8.2 Measuring Performance of PE Funds	206
8.3 Benchmark Types	212
8.4 Asset-Based Benchmarks	213
8.5 Peer Groups	215
8.6 What Is an Appropriate Benchmark?	218
8.7 Example for Benchmarking PE Funds	220
8.8 Portfolio of PE Funds	226
8.9 Conclusion	231
Notes	232
References	232

CHAPTER 9**Fund Manager Selection and Monitoring 235**

9.1 Performance Persistence	235
9.2 Manager Selection and Deal Sourcing	241
9.3 Decision-Making and Commitment	244
9.4 Principles of Fund Monitoring	245
9.5 Monitoring Objectives	246
9.6 Information Gathering and Monitoring	248
9.7 Actions Resulting from Monitoring	251
9.8 The Secondary Market	253
9.9 Conclusion	259
Notes	260
References	262

CHAPTER 10**Private Equity Operational Due Diligence 265**

10.1 The Scope and Importance of Operational Due Diligence	265
--	-----

10.2	Eight Core Elements of the Operational Due Diligence Process	268
10.3	Private Equity Operational Due Diligence Document Collection Process	269
10.4	Analyzing Private Equity Legal Documentation during Operational Due Diligence	272
10.5	Operational Due Diligence beyond Legal Document Analysis	278
10.6	On-Site Manager Visits	282
10.7	Evaluating Meta Risk	284
10.8	Fund Service Provider Review and Confirmation	285
10.9	Ongoing Private Equity Monitoring Considerations	286
10.10	Conclusion	287
	Notes	288
	References and Further Readings	288
CHAPTER 11		
	Private Equity Investment Process and Portfolio Management	289
11.1	Investment Process	290
11.2	Private Equity Portfolio: Design	293
11.3	Private Equity Portfolio: Construction	297
11.4	Risk-Return Management	300
11.5	Conclusion	306
	Notes	307
	References	308
CHAPTER 12		
	Measuring Private Equity Risk	309
12.1	Four Significant Risks of Private Equity	309
12.2	Modeling Private Equity	311
12.3	What Is the Value of a Private Equity Asset?	313
12.4	Applying the VaR Concept to Private Equity	315
12.5	Calculating VaR Based on Cash Flow at Risk	315
12.6	Conclusion	320
	Notes	321
	References	321
CHAPTER 13		
	The Management of Liquidity	323
13.1	Identifying Illiquidity and Managing Cash Flows	323
13.2	Private Equity Cash Flow Schedules	327
13.3	Five Sources of Liquidity	328
13.4	Investment Strategies for Undrawn Capital	330
13.5	Modeling Cash Flow Projections	330
13.6	Three Approaches to Forming Model Projections	331
13.7	Overcommitment	337
13.8	Conclusion	339
	Notes	340
	References	340

PART 3**Real Assets****CHAPTER 14**

Real Estate as an Investment	343
14.1 Attributes of Real Estate	343
14.2 Asset Allocation	345
14.3 Categories of Real Estate	347
14.4 Return Drivers of Real Estate	352
14.5 The Four-Quadrant Model	354
14.6 Conclusion	358
Note	358
References	358

CHAPTER 15

Real Estate Indices and Unsmoothing Techniques	361
15.1 Smoothed Pricing	362
15.2 Models of Price and Return Smoothing	365
15.3 Unsmoothing a Price or Return Series	368
15.4 An Illustration of Unsmoothing	372
15.5 Noisy Pricing	378
15.6 Appraisal-Based Real Estate Indexes	379
15.7 Transaction-Based Indices (Repeat-Sales and Hedonic)	384
15.8 Description of Major Real Estate Indices	390
15.9 Real Estate Indices Performance	393
15.10 Conclusion	398
Notes	398
References	399

CHAPTER 16

Investment Styles, Portfolio Allocation, and Real Estate Derivatives	401
16.1 Defining the Three NCREIF Real Estate Styles	402
16.2 Differentiating Styles with Eight Attributes	404
16.3 Three Purposes of Real Estate Style Analysis	404
16.4 Real Estate Style Boxes	407
16.5 Cap Rates and Expected Returns	408
16.6 Developing Risk and Return Expectations with Styles	409
16.7 Characteristics of Real Estate Derivatives	415
16.8 Types of Real Estate Derivatives and Indices	417
16.9 Conclusion	421
References	421

CHAPTER 17

Listed versus Unlisted Real Estate Investments	423
17.1 Unlisted Real Estate Funds	423
17.2 Listed Real Estate Funds	427
17.3 Market-Based versus Appraisal-Based Returns	435

17.4	Arbitrage, Liquidity, and Segmentation	439
17.5	Conclusion	448
	Note	449
	References	449

CHAPTER 18

	International Real Estate Investments	451
18.1	Overview of International Real Estate Investing	451
18.2	Opportunities in International Real Estate Investing	453
18.3	Challenges to International Real Estate Investing	462
18.4	Establishing a Global Real Estate Equity Investment Program	470
18.5	Conclusion	476
	Note	476
	References	477

CHAPTER 19

	Infrastructure as an Investment	479
19.1	Infrastructure Assets	479
19.2	Stage, Location, and Sector of Infrastructure	483
19.3	Twelve Attributes of Infrastructure as Defensive Investments	486
19.4	Accessing Infrastructure Investment Opportunities	489
19.5	Classifying Infrastructure Fund Strategies	493
19.6	Comparison of Infrastructure with Other Assets	496
19.7	Public-Private Partnerships	497
19.8	Infrastructure Regulation and Public Policy	499
19.9	Infrastructure Historical Performance	499
19.10	Conclusion	501
	References	502

CHAPTER 20

	Farmland and Timber Investments	503
20.1	Motivations for and Characteristics of Farmland Investment	503
20.2	Global Demand for Agricultural Products	505
20.3	Accessing Agricultural Returns	508
20.4	Understanding the Returns to Farmland	514
20.5	Investing in Agricultural Infrastructure	520
20.6	Global Investing in Timberland	522
20.7	Farmland and Timber Investments Compared to Other Real Assets	525
20.8	Key Points	528
20.9	Conclusion	529
	Notes	529
	References	529

CHAPTER 21

	Investing in Intellectual Property	533
21.1	Characteristics of Intellectual Property	533
21.2	Film Production and Distribution	534

21.3	Visual Works of Art	541
21.4	R&D and Patents	546
21.5	Intellectual Property and Six Characteristics of Real Assets	552
21.6	Conclusion	553
	Notes	553
	References	555

PART 4

Commodities

CHAPTER 22

Key Concepts in Commodity Markets 561

22.1	Economics of Commodity Spot Markets	561
22.2	Commodity Trading Firms, Risks, and Speculation	565
22.3	Economics of Commodity Futures Markets	570
22.4	Theories of Commodity Forward Curves	575
22.5	Decomposition of Returns to Futures-Based Commodity Investment	581
22.6	Commodities as an Inflation Hedge	582
22.7	Commodities and Exchange Rates	584
22.8	Rebalancing and Historical Performance of Commodity Futures	586
22.9	Conclusion	590
	Notes	590
	References	591

CHAPTER 23

Allocation to Commodities 593

23.1	Five Beneficial Characteristics of Allocations to Commodity Futures	593
23.2	Commodity Investment Strategies	602
23.3	Directional Strategies	602
23.4	Relative Value Strategies	605
23.5	Commodity Futures and Options Spreads	605
23.6	Capital Structure and Commodity-Based Corporations	612
23.7	Conclusion	614
	Notes	615
	References	615

CHAPTER 24

Assessing Commodity Investment Products 619

24.1	Direct Physical Ownership of Commodities	619
24.2	Indirect Ownership of Commodities	620
24.3	Leveraged and Option-Based Structures	628
24.4	Commodity Index Basics	631
24.5	Eight Sources of Commodity Index Returns	631
24.6	Issues in Commodity Index Design	634

24.7	Performance Enhancements of New Commodity Indices	637
24.8	Commodity Index Return Calculation	639
24.9	Conclusion	644
	Notes	644
	References	645

PART 5

Hedge Funds and Managed Futures

CHAPTER 25

	Managed Futures	649
25.1	The Structure of the Managed Futures Industry	649
25.2	Four Core Dimensions of Managed Futures Investment Strategies	651
25.3	Foundations of Managed Futures	658
25.4	Benefits of CTAs	666
25.5	Systematic Futures Portfolio Construction	671
25.6	Conclusion	675
	References	676

CHAPTER 26

	Investing in CTAs	677
26.1	Historical Performance of CTAs	677
26.2	Diversification Benefits of CTAs	685
26.3	CTA Risk Measurement and Risk Management	688
26.4	Three Approaches to the Benchmarking of CTAs	700
26.5	Managed Accounts and Platforms	703
26.6	Conclusion	707
	Notes	709
	References	709

CHAPTER 27

	Relative Value Strategies	711
27.1	Limits to Arbitrage of Relative Valuation	711
27.2	Convertible Arbitrage: An Overview	717
27.3	Pairs Trading and Market Neutrality	733
27.4	Conclusion	741
	Notes	743
	References	743

CHAPTER 28

	Hedge Funds: Directional Strategies	745
28.1	Financial Economics of Directional Strategies	745
28.2	Equity Long/Short	751
28.3	Global Macro	769
28.4	Historical Performance of Directional Strategies	785
28.5	Conclusion	786

Notes	786
References	786

CHAPTER 29**Hedge Funds: Credit Strategies 789**

29.1	The Economics of Credit Risk	789
29.2	Overview of Credit Risk Modeling	792
29.3	The Merton Model	793
29.4	Other Structural Models—KMV	798
29.5	Reduced-Form Models	801
29.6	Pros and Cons of Structural and Reduced-Form Models	805
29.7	Empirical Credit Models	805
29.8	Distressed Debt Investment Strategy	808
29.9	Bankruptcy Laws across the Globe	815
29.10	Implementation of Distressed Debt Strategies	819
29.11	Valuation Risks in Distressed Debt Investing	822
29.12	Asset-Based Lending	824
29.13	Conclusion	830
	Notes	830
	References	830

CHAPTER 30**Volatility, Correlation, and Dispersion Products and Strategies 833**

30.1	Volatility, Risk Factors, and Risk Premiums	833
30.2	Using Options to Manage Portfolio Volatility Exposure and Risk Premiums	835
30.3	Modeling Volatility Processes	845
30.4	Volatility Products	848
30.5	Option-Based Volatility Strategies	855
30.6	Volatility Hedge Funds and Their Strategies	859
30.7	Conclusion	865
	Notes	865
	References	866

CHAPTER 31**Hedge Fund Replication 867**

31.1	An Overview of Replication Products	867
31.2	Potential Benefits of Replication Products	868
31.3	The Case for Hedge Fund Replication	869
31.4	Unique Benefits of Replication Products	873
31.5	Factor-Based Approach to Replication	877
31.6	Payoff-Distribution Approach	882
31.7	Algorithmic (Bottom-Up) Approach	885
31.8	Alternative Mutual Funds	890
31.9	Exchange-Traded Funds	893
31.10	Conclusion	894
	Notes	895
	References	895

CHAPTER 32

Funds of Hedge Funds and Multistrategy Funds	897
32.1 Approaches to Accessing Hedge Funds	897
32.2 Characteristics of Funds of Hedge Funds	901
32.3 Funds of Funds Performance	905
32.4 Fund of Hedge Funds Portfolio Construction	907
32.5 Manager Selection	913
32.6 Benefits Offered by Funds of Hedge Funds	914
32.7 Disadvantages of Funds of Hedge Funds	916
32.8 Funds of Hedge Funds versus Multistrategy Funds	917
32.9 How Funds of Hedge Funds Add Value	919
32.10 Hedge Funds Indices	925
32.11 Conclusion	929
References	930

CHAPTER 33

Hedge Fund Operational Due Diligence	933
33.1 Distinguishing Hedge Fund and Private Equity Operational Due Diligence	933
33.2 Four Operational Steps in Analyzing Hedge Fund Operational Trading Procedures	934
33.3 Analyzing Hedge Fund Cash Management and Movement	936
33.4 Analyzing Hedge Fund External Parties	938
33.5 Analyzing Hedge Fund Compliance Considerations	942
33.6 Documenting the Operational Due Diligence Process	945
33.7 Operational Decision Making and Allocation Considerations	946
33.8 Investigative Due Diligence	948
33.9 Four Approaches to Resource Allocation for Operational Due Diligence	950
33.10 Hedge Fund Governance	952
33.11 Hedge Fund Insurance	954
33.12 Performing Operational Due Diligence on Funds of Hedge Funds	955
33.13 Conclusion	956

CHAPTER 34

Regulation and Compliance	957
34.1 Three Foundational Principles of Financial Market Regulation	957
34.2 The Regulation of Alternative Investments within the United States	958
34.3 Alternative Investment Regulation in Europe	969
34.4 Hedge Fund Regulation in Asia	979
34.5 Conclusion	983
Notes	983

PART 6**Structured Products****CHAPTER 35****Structured Products-I Fixed-Income Derivatives and Asset-Backed Securities 991**

35.1	Overview of Term Structure Modeling	991
35.2	Equilibrium Models of the Term Structure	992
35.3	Arbitrage-Free Models of the Term Structure	996
35.4	Interest Rate Derivatives	999
35.5	Asset-Backed Securities	1013
35.6	Auto Loan-Backed Securities	1014
35.7	Credit Card Receivables	1016
35.8	Conclusion	1018
	Notes	1018
	References	1018

CHAPTER 36**Structured Products II: Insurance-Linked Products and Hybrid Securities 1021**

36.1	Insurance-Linked Securities	1021
36.2	Overview of Non-Life ILS: Catastrophe Bonds	1021
36.3	Life ILS: Longevity and Mortality Risk-Related Products	1030
36.4	Hybrid Products: Mezzanine Debt	1037
36.5	Conclusion	1050
	Notes	1051
	References	1051

Appendix A**Alternative Presentations of Mean-Variance Optimization 1053****Index 1055**

Preface

Alternative Investments: CAIA Level II is designed as the primary reading resource for the Level II exam of the Chartered Alternative Investment Analyst (CAIA) Association's Charter program. To ensure that the material best reflects up-to-date practices in the area of alternative investments, the CAIA Association invited a group of leading industry professionals and academics to contribute to the production of this book. While some of them helped directly by writing some of the chapters of this book, others provided valuable input as members of our advisory board. Without their immense talent and dedication, this book would not have been completed.

Since its inception in 2002, the CAIA Association has strived to be the leader in alternative investment education worldwide and to be the catalyst for the best education in the field wherever it lies. The CAIA program was established with the help of a core group of faculty and industry experts who were associated with the Center for International Securities and Derivatives Markets (CISDM) at the Isenberg School of Management and the Alternative Investment Management Association (AIMA). From the beginning, the CAIA Association recognized that a meaningful portion of its curriculum must be devoted to codes of conduct and ethical behavior in the investment profession. To this end, with the permission and cooperation of the CFA Institute, we have incorporated its Code of Ethics and its *Standards of Practice Handbook* into our curriculum. Further, we have leveraged the experience and contributions of our members and other alternative investment professionals who serve on our board and committees to create and update the CAIA Association program's curriculum and its associated readings.

The quality, rigor, and relevance of our curriculum readings derive from the ideals upon which the CAIA Association was based. The CAIA program offered its first Level I examination in February 2003. Our first class consisted of 43 dedicated investment professionals who passed the Levels I and II exams and met the other requirements of membership. Many of these founding members were instrumental in establishing the CAIA designation as the global mark of excellence in alternative investment education. Through their support and with the help of the founding cosponsors—the AIMA and the CISDM—the CAIA Association is now firmly established as the most comprehensive and credible designation in the rapidly growing sphere of alternative investments.

The AIMA is the hedge fund industry's global, not-for-profit trade association, with more than 1,500 corporate members worldwide. Members include leading hedge fund managers, fund of hedge funds managers, prime brokers, legal and accounting services, and fund administrators, all of whom benefit from the AIMA's active influence in policy development; its leadership in industry initiatives, including education and sound practice manuals; and its excellent reputation with regulators.

The CISDM of the Isenberg School of Management at the University of Massachusetts–Amherst seeks to enhance the understanding of the field of alternative investments through research, education, and networking opportunities for member donors, industry professionals, and academics.

The CAIA Association has experienced rapid growth in its membership over the past 14 years. It is now a truly global professional organization, with more than 8,000 members in over 80 countries. We strive to stay nimble in our process so that the curriculum remains relevant and keeps pace with the constant changes in this dynamic industry.

Although the CAIA Association's origins are largely based in the efforts of professionals in the hedge fund and managed futures space, these founders correctly identified a void in the wider understanding of alternative investments as a whole. From the beginning, the CAIA curriculum has also covered private equity, commodities, and real assets, always with an eye toward shifts in the industry. Today, several hundred CAIA members identify their main area of expertise as real estate or private equity, and several hundred more are from family offices, pension funds, endowments, and sovereign wealth funds that allocate across multiple classes within the alternative investment industry. To ensure benefit to the widest spectrum of members, we have developed curriculum subcommittees that represent each area of coverage within the curriculum. Alternative investment areas and products share some distinct features, such as the relative freedom on the part of investment managers to act in the best interests of their investors, alignment of interests between asset owners and asset managers, and relative illiquidity of the investment positions of some investment products. These characteristics necessitate conceptual and actual modifications to the standard investment performance analysis and decision-making paradigms.

Our curriculum readings are designed with two goals in mind: first, to provide readers with the tools needed to solve problems they encounter in performing their professional duties; and second, to provide them with a conceptual framework that is essential for investment professionals who strive to keep up with new developments in the alternative investment industry.

Readers will find the publications in our series to be beneficial, whether from the standpoint of allocating to new asset classes and strategies in order to gain broader diversification or from the standpoint of a specialist needing to better understand the competing options available to sophisticated investors globally. In both cases, readers will be better equipped to serve their clients' needs.

CAIA Level II required readings consist of three parts: this book and the CFA Institute's *Standards of Practice Handbook* and *Current and Integrated Topics Readings*. Information about obtaining the last two components can be found on our website, caia.org. Many resources are freely available on our website as well.

We will continue to update the *CAIA Level II Study Guide* every six months (each exam cycle). The study guide outlines all of the readings and corresponding learning objectives (LOs) that candidates are responsible for meeting. The guide also contains important information for candidates regarding the use of LOs, testing policies, topic weightings, where to find and report errata, and much more. The entire exam process is outlined in the *CAIA Candidate Handbook*, which is available at caia.org. Candidates can also access a workbook that solves the problems presented at the end of each chapter and other important study aids.

We believe you will find this series to be the most comprehensive, rigorous, and globally relevant source of educational material available within the field of alternative investments.

Hossein Kazemi, PhD
Senior Adviser to the CAIA Association

Acknowledgments

We would like to thank the many individuals who played important roles in producing this book. In particular, we owe great thanks to William Kelly, Chief Executive Officer of the CAIA Association, and our committee members:

Curriculum Advisory Council

Stephane Amara, CAIA
Mark Anson, CAIA
Garry Crowder
David McCarthy
Tom Robinson, CAIA
Hilary Till
James Tomeo

Hedge Funds, CTAs, and Fund of Hedge Funds Committee

Jaeson Dubrovay, CAIA
Mark Hutchinson
Kathryn Kaminski, CAIA
Jim Liew
Hamlin Lovell, CAIA
Putri Pascualy
Mark Wiltshire, CAIA

Real Assets (Real Estate, Commodities, Infrastructure, Intellectual Properties, and Natural Resources) Committee

Tom Arnold, CAIA
Andrew Baum
Georg Inderst
Sameer Jain
Tom Johnson, CAIA
David Lynn
George A. Martin

Joelle Miffre
Richard Spurgin

Private Equity and Venture Capital Committee

James Bachman, CAIA
Erik Benrud, CAIA
Douglas Cumming
Ludovic Phalippou
Pierre-Yves Mathonet
Thomas Meyer
Gitanjali M. Swamy

Due Diligence, Risk Management, and Regulation Committee

Gordon Barnes, CAIA
Michal Crowder
Jason Scharfman
Christopher Schelling, CAIA
Sean Gill, CAIA
Tom Kehoe
Danny Santiago, CAIA

Asset Allocation, Endowments, Pension Funds, and Sovereign Funds Committee

Samuel Gallo, CAIA
James T. Gillies, CAIA

Special credit goes to CAIA staff for their valuable contributions in painstakingly bringing the third edition to completion.

CAIA Staff

Stephen Abernathy, Associate Director of Research and Publications
Nelson Lacey, Director of Exams
Kathy Champagne, Senior Associate Director Exams Administration
Kristaps Licitis, Senior Associate Director of Exams
Nancy E. Perry, Publications Coordinator

Outside Editor

Jamie Thaman

About the Authors

Hossein Kazemi received his PhD from the University of Michigan, Ann Arbor and is a senior adviser to the CAIA Association. He is the Michael and Cheryl Philipp Professor of Finance at the University of Massachusetts–Amherst, Director of the Center for International Securities and Derivatives Markets, a cofounder of the CAIA Association, and Editor-in-Chief of *The Journal of Alternative Investments*—the official publication of the CAIA Association. He was a managing partner at Schneeweis Partners and Alternative Investment Analytics. He has authored or coauthored more than 30 scholarly articles and is a coauthor of *The New Science of Asset Allocation: Risk Management in a Multi-Asset World* (2010, John Wiley & Sons) and *Postmodern Investment* (2013, John Wiley & Sons).

Keith Black received his PhD at the Illinois Institute of Technology, Chicago. He serves as Managing Director of Curriculum and Exams at the CAIA Association. He was previously an Associate at Ennis Knupp and an Assistant Professor at Illinois Institute of Technology. He is a member of the editorial board of *The Journal of Alternative Investments*. He is also a CFA Charter Holder and a member of the inaugural class of CAIA candidates. He is the author of *Managing a Hedge Fund* (2004, McGraw-Hill). He was named to *Institutional Investor* magazine’s list of “Rising Stars of Hedge Funds” in 2010.

Don Chambers received his PhD from the University of North Carolina, Chapel Hill. He is Associate Director of Programs at the CAIA Association; the Walter E. Hanson/KPMG Professor of Finance at Lafayette College in Easton, Pennsylvania; and Chief Investment Officer of Biltmore Capital Advisors. Professor Chambers previously served as Director of Alternative Investments at Karpus Investment Management. He is a member of the editorial board of *The Journal of Alternative Investments*. He is also a CAIA Charter Holder and the primary author of *Alternative Investments: CAIA Level I*, third edition (2015, John Wiley & Sons).

Mark Anson is Chief Investment Officer of Commonfund. He is responsible for overall client asset allocation, portfolio management, manager research and due diligence across equities, fixed income, and hedge funds. Prior to joining Commonfund, he was Chief Investment Officer for the Bass Family Office. Previously, Mark has served as President of Nuveen Investments, Chief Executive Officer and Chief Investment Officer for Hermes Pension Management and for the British Telecom Pension Scheme, and the Chief Investment Officer for CalPERS. Mark currently serves on the Executive Advisory Board of MSCI-Barra, The Investment Advisory Council of the UAW Pension Fund, the Law Board of Northwestern University School of Law, and the Board of Directors for the Chartered Alternative Investment Association. Mark earned a BA in Economics and Chemistry from St. Olaf College, a JD from

Northwestern University School of Law, and a PhD and Master's in Finance from Columbia University Graduate School of Business. Mark earned the Chartered Financial Analyst, Chartered Alternative Investment Analyst, Certified Public Accountant, and Chartered Global Management Accountant professional degrees, and is a Member of the Bar of the State of New York and the State of Illinois.

Jim Campasano is the President of Marshall James Capital, LLC, an advisory firm focusing on volatility products. A graduate of Harvard University with a degree in Economics, cum laude, he received a JD from Vanderbilt University School of Law and is a PhD candidate in finance at the Isenberg School of Management, University of Massachusetts–Amherst. Prior to Marshall James Capital, Mr. Campasano worked as a portfolio manager at Vicis Capital and Millennium Limited Partners, where he ran a long volatility, cross-asset portfolio. He contributed to Chapter 30 (Volatility, Correlation, and Dispersion Products and Strategies).

Michal E. Crowder received her JD from Northwestern University School of Law in Chicago and has a Master of Arts in Political Science from Northwestern University. Ms. Crowder has worked for several hedge fund and investment management firms over the past eight years and has traveled extensively throughout Europe and Asia. She is fluent in four languages and supports a number of not-for-profit endeavors. Ms. Crowder is licensed to practice law in Illinois and currently clerks for the Honorable Judge Abdul Kallon in the United States District Court of Northern Alabama. She is the primary author of Chapter 34 (Regulation and Compliance).

Satyabrota Das has more than 10 years of experience working in financial markets. He has developed and traded hedge fund and CTA replication products using liquid exchange-traded securities. Most recently, he developed an interactive web-based replication program that allows investors to create customized replication portfolios. Previously, he supported the Alternative Commodity Benchmark Index, a second-generation commodity index, for Alternative Investment Analytics, LLC. He is a CFA and CAIA Charter Holder, and is working on his PhD at the Isenberg School of Management, University of Massachusetts–Amherst. He is the primary author of Chapter 31 (Hedge Fund Replication).

Malay K. Dey is currently a senior partner of FINQ LLC, a diversified financial technology startup. He held faculty positions at the University of Illinois at Urbana Champaign, Cornell University, and the University of Minnesota, Twin Cities. Professor Dey has frequently visited the Indian Institute of Management Calcutta (IIMC) and has lectured at ISI Calcutta and other leading Indian institutions. He was a Research Fellow at the Networks Financial Institute at Indiana State University (2006–2008) and served as a Vice President, quantitative trading strategy, at ITG from 2006 to 2007. Professor Dey received his PhD in Finance from the Isenberg School of Management, University of Massachusetts–Amherst. His research focuses on theoretical and empirical issues related to institutional trading and liquidity in equity markets. He contributed to Chapter 27 (Relative Value Strategies).

Jaeson Dubrovay is a Managing Director at Blackcomb Holdings, Inc., an independent investment company. Previously he was a partner and cohead of Americas

advisory for Aksia, LLC, one of the largest hedge fund specialty consulting firms. Prior to that, he was the Senior Strategist, Hedge Funds, at NEPC LLC, one of the industry's leading general investment consulting firms. Mr. Dubrovay has been managing money and consulting with leading institutional investors in connection with their hedge fund portfolios for more than 25 years. In 2008, he was named the Hedge Fund Consultant of the Year (*Institutional Investor*) and recognized for his contribution to the Investors Committee of the President's Working Group on Financial Markets, on Hedge Fund Best Practices. In 2009, Mr. Dubrovay was named Consultant of the Year by Foundation & Endowment Money Management (*Institutional Investor*) and was the major contributor to the team at NEPC that was named *PLANSPO**N**S**O**R* magazine's Alternative Asset Consultant of the Year. He is a CPA and CAIA Charter Holder. He holds an MBA with honors from Santa Clara University. He is the primary author of Chapter 32 (Funds of Hedge Funds and Multistrategy Funds).

Urbi Garay received a PhD in Finance from the Isenberg School of Management, University of Massachusetts–Amherst, an MA from Yale University, and a BA in Economics from *Universidad Católica Andrés Bello* (Caracas, Venezuela). He is a Professor of Finance at the IESA Business School (Caracas, Venezuela). He was a visiting researcher at the CISDM (2007–2008), and has been a visiting professor at various business schools in Latin America, the United States, and Europe. He has been a consultant to the Inter-American Development Bank, the Venezuelan Central Bank, and the Caracas Stock Exchange. He is a coauthor of *Fundamentals of Finance* (IESA, 2005) and *Long Term Investing* (IESA, 2007). He has published articles in *The Journal of Alternative Investments*, *Emerging Markets Review*, *Emerging Markets Finance and Trade*, *Econometrics*, *Corporate Governance: An International Review*, and the *Journal of Business Research*. He is the primary author of Chapters 14–18 (Real Estate) and 35–36 (Structured Products).

Kathryn Kaminski is a Director at Investment Strategies at Campbell & Company. Prior to her recent move to Campbell & Company, she was Deputy Managing Director at the Institute for Financial Research (SIFR) and affiliated faculty at the Stockholm School of Economics. She is a featured contributor to the CME Group. Kathryn has experience working for a CTA fund of funds as well as quant experience in both emerging fixed income and credit markets. She lectures on derivatives, hedge funds, and financial management at the Stockholm School of Economics and has lectured previously at the Swedish Royal Institute of Technology (KTH) and the MIT Sloan School of Management. Kathryn completed her PhD at MIT Sloan, conducting research on financial heuristics. Kathryn is a coauthor of *Trend Following with Managed Futures: The Search for Crisis Alpha* (2014, John Wiley & Sons). Kathryn is a 100-Women in Hedge Funds PAAMCO CAIA Scholar and a CAIA Charter Holder. She is the primary author of Chapters 25 and 26 (Managed Futures).

Jim Kyung-Soo Liew is an Assistant Professor of Finance at Johns Hopkins Carey Business School. Dr. Liew teaches Advanced Hedge Fund Strategies, Corporate Finance, Derivatives, Entrepreneurial Finance, Fixed Income, and Wealth Management at the Johns Hopkins Carey Business School. Prior joining Johns Hopkins, Dr. Liew taught Statistical Arbitrage at Columbia University and CUNY Baruch College, and Hedge Fund Strategies at NYU Stern School of Business, as an Adjunct Professor.

Prior to that, he worked in the hedge fund industry where he built and implemented systematic investment strategies. Dr. Liew currently serves on the Editorial Advisory Board of *The Journal of Portfolio Management*. He resides with his wife and two daughters just outside of Baltimore. He is the primary author of Chapter 28 (Hedge Funds: Directional Strategies).

George Martin is a Senior Advisor to Wood Creek Capital Management, a real assets investment manager that is an affiliate of MassMutual and its asset management subsidiary Babson Capital Management. At Wood Creek, he has particular responsibility for matters related to research, portfolio construction, and risk management, and with a sector focus that emphasizes mid- and upstream agriculture. He is also a Senior Research Associate for the Center for International Securities and Derivatives Markets (CISDM) at the University of Massachusetts, Amherst, and a member of the Editorial Board of *The Journal of Alternative Investments*. He has been commercially active in real asset investing and commodity-based investments for the past decade. He is regularly called upon to speak on various aspects of the Alternative Investment business, and frequently publishes his research. Previously, he was a Research Fellow at the Brookings Institution. He has a BA and MA from Johns Hopkins University. He is the primary author of Chapters 20 and 21 (Real Assets).

Pierre-Yves Mathonet is Head of Risk in the Private Equities Department of the Abu Dhabi Investment Authority. He is a permanent member of the EVCA's Risk Measurement Guidelines working group. He codirected the Certificate in Institutional Private Equity Investing (CIPEI) course held by the Oxford Saïd Business School's Private Equity Institute. Previously, he was the head of the private equity risk management division of the European Investment Fund (part of the European Investment Bank group), worked as an investment banker in the technology groups of Donaldson, Lufkin & Jenrette and Credit Suisse First Boston, and, earlier, for the audit and consulting departments of PricewaterhouseCoopers. Pierre-Yves has coauthored several books including *Beyond the J Curve* (2005, John Wiley & Sons) and *J Curve Exposure* (2007, John Wiley & Sons). He holds a Master of Science cum laude in Finance from London Business School and a Master of Science magna cum laude in Management from Solvay Business School in Brussels. He is also a Certified European Financial Analyst cum laude. Pierre-Yves Mathonet and Thomas Meyer are the primary authors of Chapters 7–9 and 11–13 (Private Equity and Venture Capital).

Thomas Meyer is partner and cofounder of LDS Partners, specializing in the development of investment strategies, portfolio management, cash-flow forecasting, and asset allocation models for real assets (private equity, infrastructure, real estate). Mr. Meyer was responsible for the creation of the European Investment Fund's risk management function and was a director of EVCA (now Invest Europe). He was the secretary of the EVCA Private Equity Risk Measurement Group, codirected the limited partner course delivered by the Private Equity Institute at the Saïd Business School, University of Oxford, that led to the EVCA-awarded CIPEI. He is a Shimomura Fellow of the Development Bank of Japan and was a visiting researcher at Hitotsubashi University in Tokyo. Other career stations include intelligence officer in the German Air Force and CFO of Allianz Asia Pacific in Singapore. Mr. Meyer has published

several books on investment strategies and risk management for real assets. He has authored *Private Equity Unchained* (2015, Palgrave MacMillan) and is the coauthor of *Beyond the J Curve* (2005, John Wiley & Sons), *J Curve Exposure* (2007, John Wiley & Sons), and *Mastering Illiquidity* (2011, John Wiley & Sons). Thomas Meyer and Pierre-Yves Mathonet are the primary authors of Chapters 7–9 and 11–13 (Private Equity and Venture Capital).

Putri Pascualy is a Partner and Managing Director at PAAMCO. She manages the firm's Long/Short Credit Portfolio and is the Portfolio Manager for custom portfolios for leading institutional investors. Ms. Pascualy leads the firm's investment efforts in corporate credit including high-yield bonds, bank loans, event-driven and opportunistic credit, distressed debt, and structured products. In addition to her research responsibilities, her expertise includes portfolio construction, structuring, and risk management of complex portfolios and investments throughout various market cycles. She graduated from UC Berkeley with a BA in Economics and an MBA from the Haas School of Business. Putri is also a frequent contributor to media outlets including the *Wall Street Journal*, Bloomberg and Bloomberg Television, *U.S. News and World Report*, *Barron's*, the *Financial Times*, and CNBC. She is the author of *Investing in Credit Hedge Funds: An In-Depth Guide to Building Your Portfolio and Profiting from the Credit Market* (2013, McGraw-Hill). She is the primary author of Chapter 29 (Hedge Funds: Credit Strategies).

Jason Scharfman is a Managing Partner of Corgentum Consulting, LLC. Corgentum is a specialty consulting firm that performs operational due diligence reviews and background investigations on fund managers of all types globally including hedge funds, private equity, and real estate funds. Mr. Scharfman is recognized as one of the leading experts in the field of operational due diligence and is the author of *Hedge Fund Governance: Evaluating Oversight, Independence, and Conflicts* (2014, Academic Press), *Private Equity Operational Due Diligence: Tools to Evaluate Liquidity, Valuation, and Documentation* (2012, John Wiley & Sons) and *Hedge Fund Operational Due Diligence: Understanding the Risks* (2008, John Wiley & Sons). Before founding Corgentum, he oversaw the operational due diligence function for a \$6 billion alternative investment allocation group called Graystone Research at Morgan Stanley. Prior to joining Morgan Stanley, he held positions at Lazard Asset Management, SPARX Investments and Research, and Thomson Financial. Mr. Scharfman received a BS in Finance with an additional major in Japanese from Carnegie Mellon University, an MBA in Finance from Baruch College's Zicklin School of Business, and a JD from St. John's School of Law. He is the primary author of Chapters 10 and 33 (Private Equity and Hedge Fund Operational Due Diligence).

Ed Szado is an Assistant Professor of Finance at Providence College and the Director of Research at the Institute for Global Asset and Risk Management. Dr. Szado earned a PhD in Finance from the Isenberg School of Management, University of Massachusetts–Amherst, an MBA from Tulane University, and a BComm from McMaster University. He has taught at Boston University, Clark University, Providence College, and the University of Massachusetts–Amherst. He is a former options trader and has worked extensively on asset allocation and risk managed investment

programs. He was a founding coeditor of the *Alternative Investment Analyst Review* (AIAR) and currently a member of the editorial board of *The Journal of Alternative Investments* (JAI). He is a CFA Charter Holder and has consulted to the Options Industry Council, the Chicago Board Options Exchange, the Chartered Alternative Investment Analyst Association, and the Commodity Futures Trading Commission. He is the primary author of Chapters 22–24 (Commodities).